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New Evidence on Asset Location from the Survey of Consumer Finances

Yothin Jinjarak[1] and Jie Zhou[2]

Abstract

This article provides new evidence on household asset location decisions using the latest Survey of Consumer Finances (SCF). The authors find that the difference between the equity share in tax-deferred accounts (TDAs) and the equity share in taxable accounts (TAs), a measure of asset location in the article, declined significantly after 2001. They also discuss potential explanations of the change in asset location.

Keywords

portfolio choice, asset location, tax-deferred accounts, Survey of Consumer Finances

[1] Department of Financial and Management Studies, SOAS, University of London, London, UK
[2] Division of Economics, Nanyang Technological University, Singapore, Singapore

Corresponding Author:
Jie Zhou, Division of Economics, Nanyang Technological University, Singapore 637332, Singapore
Email: zhoujie@ntu.edu.sg

Assets held in tax-deferred accounts (TDAs) are a large and growing component of household net wealth in the United States.[1] For example, 401(k) assets were estimated at $1.8 trillion and Individual Retirement Account (IRA) assets stood at $2.8 trillion in 2003 (The Vanguard Group 2004). According to the 2004 Survey of Consumer Finances (SCF), about 40 percent of households have assets in both taxable and tax-deferred accounts. The median household with both accounts had 64.2 percent of its total financial assets in TDAs in 2004, and the mean was 59.0 percent. For households with both accounts, they need to simultaneously decide (1) how much of each type of asset to hold (asset allocation decision) and (2) where to hold these assets (asset location decision). Given that households hold a great deal of wealth in both accounts and that asset location decisions could have a significant impact on retirement wealth accumulation, it is important to investigate the asset location decisions these households make. The topic has attracted much attention from researchers in public finance and financial economics as well as financial planners from the industry. For example, conventional wisdom has suggested that households should hold higher-taxed assets in TDAs (Black 1980; Tepper 1981).

This article uses the latest SCFs to analyze asset location decisions for households having access to both taxable and tax-deferred accounts. Given that Bergstresser and Poterba (2004) have documented households' asset location decisions using the 1989–2001 SCFs, out main interest in this article is to examine whether there is any change in households' asset location decisions after 2001.

We first report summary statistics for the sets of households that face asset location decisions in the latest surveys. Then we present the results of our empirical analysis of the cross-sectional determinants of asset allocation and asset location. The difference between the equity share in TDAs and the equity share in taxable accounts (TAs) is used as a measure of asset location in the article.[2] Finally, we investigate the asset location patterns across surveys. Given that the question on asset composition for certain accounts changed after 2001, we propose three methods to calculate the share of equity in each account and find the asset location measure. We run several regressions of the asset-location measure on standard determinants and year dummies. For all three methods, we find that the coefficients of the year 2004 and 2007 dummy variables are significantly negative when we pool surveys in 2001, 2004, and 2007. This suggests that the asset location pattern may have changed in an important way after 2001. Compared to that in 2001, the difference between the equity share in TDAs and the equity share in TAs dropped 8 to 9 percentage points

in 2004 and 4 to 6 percentage points in 2007. The decline was largely driven by the sharp drop of the equity share in TDAs.

What accounts for the change in asset location after 2001? There are a number of possibilities. After discussing these possibilities, we associate our preliminary finding to two potential explanations, though we are not able to identify them independently. First, the stock market meltdown in 2001–2003 may have induced many households to cut back stock holdings. Because there is no tax consequence in rebalancing portfolio in the TDAs, households may have adjusted their stock holdings in the TDAs.[3] If these households maintain their lower equity exposure in the TDAs after the adjustment, the difference between the equity share in the TDAs and the equity share in the TAs would drop after 2001.

Second, the change in asset location may be related to the Jobs and Growth Tax Relief and Reconciliation Act of 2003 (hereafter, the "2003 tax cut").[4] The main provisions of the 2003 tax cut introduced a favorable treatment for dividend income and realized long-term capital gains in TAs.[5] The new rates do not apply to dividends or capital gains received in TDAs because returns are tax deferred in those accounts. Thus, the 2003 tax cut significantly lowered the tax rate on stock returns in TAs and hence increased the gap between the tax rate on bond returns and the tax rate on stock returns. It may have an important impact on households' asset location decisions. This is because when households make asset location decisions, essentially they are comparing the benefits from pretax accumulation of stock returns and after-tax accumulation of bond returns with the benefits from pretax accumulation of bond returns and after-tax accumulation of stock returns. Thus, changes in the tax code affect the benefits from pretax accumulation and hence asset location decision. The tax cut may have induced many households to hold fewer stocks in TDAs and contributed to the change in asset location because the benefits from pretax accumulation of stock returns (and after-tax accumulation of bond returns) have decreased.[6]

Previous studies have recognized the importance of distinguishing between assets held in TA and TDA (Poterba 2004; Reichenstein 2006). This article is closely related to the growing literature on asset location decisions. Theoretical models (particularly in a static setting) have suggested that TDAs should be specialized in higher-taxed assets (e.g., taxable bonds). Households are advised not to hold taxable bonds in TAs if an opportunity to move them to TDAs exists (Black 1980; Tepper 1981; Dammon, Spatt, and Zhang 2004). However, empirical work tends to find that households maintain a higher equity position in TDAs than in TAs (Bodie and Crane 1997; Amromin 2003; Bergstresser and Poterba 2004). Several studies have examined the

"asset location puzzle." Using a three-period model, Amromin (2003) suggests that the precautionary motive matters for asset location due to the penalty on early withdrawals from TDAs. Shoven and Sialm (2003) analyze a two-period model and show that corporate bonds and stocks with high distributions have a preferred location in TDAs and that tax-exempt municipal bonds and stocks with low distributions have a preferred location in TAs. In a recent article, Zhou (2009) numerically solves a calibrated life cycle model and finds that both tax code and capital gains realization rate are important for determining optimal asset location since they affect the benefits from pretax accumulation.

This article contributes to the above-mentioned literature by providing new evidence on households' asset location decisions using the latest SCFs. It is organized as follows. Data and Summary Statistics section describes the data and documents household asset location decisions in SCFs. Changes in Asset Location section compares asset location patterns across surveys by estimating regression models. We also discuss potential explanations of the change in asset location. Our conclusions are presented in the final section of the article.

Data and Summary Statistics

This section first describes how we measure the composition of household portfolios in TAs and TDAs using the latest SCFs. We then document asset location decisions for households having both accounts.

Data Description

The SCF is a triennial survey that provides the most complete data on household balance sheets in the United States.[7] It reports data on assets both inside and outside TDAs and contains extensive demographic information. The data summarized below are from the 2004 and the 2007 SCFs. All statistics utilize population weights.

The reasons why we pay attention to the latest surveys are (1) Bergstresser and Poterba (2004) have documented households' asset location decisions using the 1989–2001 SCFs and (2) the question on asset allocation for certain accounts (i.e., how is the money invested) in SCF has changed since 2004. We plan to examine asset location in the 2004 and 2007 SCFs first. We then compare it with that in the 2001 SCF. More details are given in the Changes in Asset Location section.

For assets in each survey, we focus on the following broad categories: (1) financial assets in regular TAs,[8] (2) financial assets in TDAs,[9] (3) real

estate assets,[10] and (4) private business equity. We construct measures of stocks held in both TAs and TDAs. For assets held in the TAs, SCF respondents report separately the dollar value of direct stock holdings, stocks held in mutual funds, and stocks held in other accounts. Aggregating these stock holdings provides a measure of all stocks held in the TAs.

The composition of holdings in the TDAs can be inferred from categorical responses. In the 2004 and 2007 SCFs, the question on allocation of defined contribution pension plans asks,

X11036(#1a) How is it invested? Is it all in stocks, all in interest-earning assets, is it split between these, or something else?

1. *ALL IN STOCKS
2. *ALL IN INTEREST EARNING ASSETS
3. *SPLIT
4. Real estate
5. Hedge fund
6. Annuities
8. Mineral rights
-7. *OTHER
0. Inap.

Thus, in the 2004 and 2007 surveys all of the account value is assigned to stocks if the answer to the question is "1" and non stocks if the answer is "2." In the case of a split (answer "3"), the survey asks the exact percentage of stocks in the plan and we use that exact percentage to measure stock holdings. Next, we compute measures of the stock market participation rate and asset allocation in both TA and TDA. Stock market participation is determined by checking whether the value of stocks in each account is greater than zero.

Total liability for each household is the sum of credit card balance, lines of credit, education loans, other consumer loans, margin loans at brokerage accounts, mortgage and other loans on the principal residence, loans or mortgages on investment real estate and vacation properties, and vehicle loans. For nonfinancial income, we adopt a broad definition: it is defined as the sum of total reported labor income, unemployment or worker's compensation, social security, child support, and other welfare and transfers.

Households with Both Accounts

How many households in SCF face asset location choices? Table 1 shows the percentage of households having assets in both TAs and TDAs in the latest two surveys.

Table 1. Percentage of Households with Assets in Both Taxable Accounts (TAs) and Tax-deferred Accounts (TDAs)

	2004	2007
All households	40.0%	41.2%
Households under age 60	42.1%	43.3%
Households over age 60	34.6%	35.9%

Table 2. Sample Statistics in 2004 Survey of Consumer Finances

	Households with both accounts	Other households
Head age (mean/median)	49.5/48	49.6/47
Years of school (mean/median)	14.5/15	12.5/12
White	85.7%	65.5%
Married	67.4%	39.9%
Nonfinancial income ($, mean/median)	93393.6/66000	37221.4/26950
Total financial assets ($, mean/median)	329316.7/87000	48486.9/250
Total real estate assets ($, mean/median)	387113.8/200000	136387.4/50000
Private business equity ($, mean/median)	144339.9/0	39668.0/0
Total mortgage ($, mean/median)	112513.6/61000	41212.6/0
Other liability ($, mean/median)	22606.3/8000	10498.0/1700

According to our definition of TAs and TDAs, approximately 40 percent of SCF households report ownership of both accounts. Grouping households by the age of household head, below and above sixty years old,[11] Table 1 shows that younger households are more likely to have access to both accounts than older households (42.1 percent vs. 34.6 percent in 2004). This difference probably reflects the growing availability of employer-sponsored TDAs, such as 401(k) plans.

Table 2 provides summary statistics for households in the 2004 SCF, divided into households with assets in both accounts and those who do not have both accounts. A number of observations are noteworthy. Households with both accounts are mostly married. Their nonfinancial income and wealth holdings are substantially larger than those without both accounts.

Next we focus exclusively on households having both accounts. Are asset location decisions an important issue for these households? If TDAs

Table 3. TDA Assets as a Percentage of Total Financial Assets in 2004 SCF

	Mean	Median
All households		
Total financial assets: ≤$10K	67.0%	73.4%
Total financial assets: ($10K, $100K]	63.5%	72.1%
Total financial assets: ($100K, $500K]	57.6%	62.6%
Total financial assets: ($500K, $1M]	48.7%	49.1%
Total financial assets: >$1M	36.2%	26.7%
All	59.0%	64.2%
Households under age 60		
Total financial assets: ≤$10K	65.6%	70.7%
Total financial assets: ($10K, $100K]	66.3%	75.0%
Total financial assets: ($100K, $500K]	62.1%	70.9%
Total financial assets: ($500K, $1M]	54.5%	54.9%
Total financial assets: >$1M	36.6%	26.7%
All	63.0%	70.5%
Households over age 60		
Total financial assets: ≤$10K	81.5%	90.6%
Total financial assets: ($10K, $100K]	45.1%	30.9%
Total financial assets: ($100K, $500K]	48.5%	45.5%
Total financial assets: ($500K, $1M]	41.7%	37.6%
Total financial assets: >$1M	35.7%	26.5%
All	46.4%	39.0%

Note: TDA = tax-deferred account; SFC = Survey of Consumer Finances.

balances only account for a small part of households' total financial assets, asset location decisions may be not important. Table 3 reports the distribution of TDAs assets as a percentage of total financial assets for households with both accounts in the 2004 SCF.

We can see that the median household with both accounts had 64.2 percent of its total financial assets in the TDAs. Across households with both accounts, the mean was 59.0 percent in 2004. Thus, households with both accounts carried substantial assets in the TDAs. For households with large holdings of financial assets (greater than one million dollars), TDAs assets as a percentage of total financial assets was lower, but the mean still stood at 36.2 percent. Comparing by the age of the household head, TDAs assets represent a higher share of the total financial assets of households with a head below the age of sixty than that of households with a head over the age of sixty. This pattern is reasonable as the older households tend to withdraw funds from their TDAs to finance retirement. Another possibility is that

some older households may have fewer years of coverage because the historical access to TDAs has not been uniform across the age cohorts.

Table 4 presents more detailed information on the sets of households that face asset location decisions. It shows the proportion of households with both accounts above various threshold levels of assets in the 2004 SCF. Most households have moderate assets in each account. Households carrying assets in the range of $10,000 to $50,000 in both accounts compose the largest group, making up 9.6 percent of all households having assets in both accounts.

Determinants of Asset Allocation and Asset Location

To explore portfolio choice and particularly asset location decisions for households with both accounts, we now distinguish two types of assets: stocks and nonstocks. Because households have access to both accounts, they can acquire each type of asset in either account or both. The percentage of households who hold stocks (in either account or both) is large for households having both accounts. The stock market participation rates were 92.3 percent and 91.2 percent in 2004 and 2007, respectively.

Households differ widely in asset allocation. We now estimate regression models to explain asset allocation in each account. We also estimate a regression model in which the dependent variable is the difference between the equity share in the TDAs and the equity share in the TAs. This difference provides a measure of households' asset location decisions.

The sample in the regressions includes all households having both accounts and holding stocks (in either account or both). The analysis can be done with a simple OLS specification:

$$Y = X'\beta + \varepsilon, \tag{1}$$

where Y represents the equity share in the TDAs, the equity share in the TAs, and the asset location measure, respectively; X is a set of standard household characteristics. Following the literature, we include as household characteristics age, household size, education, race, marital status, reported attitude toward financial risk (the measure of risk aversion), receiving financial advice (from broker or financial planner) or not, nonfinancial income, financial assets in the TAs, financial assets in the TDAs, real estate net worth, mortgage liability, other liability, and private business equity.[12]

Table 5 reports the results from the 2004 SCF.[13] Column 1 presents a regression equation in which the dependent variable is the share of equity in the TAs. The coefficient estimates suggest a positive and statistically significant relationship between TAs assets and the share of equity in the TAs.

Table 4. Percentage of Households with Both Accounts above Threshold Levels in 2004 SCF

		Value of Assets in TA						
		≤$5K	($5K, $10K)	($10K, $50K)	($50K, $100K)	($100K, $500K)	($500K, $1M)	>$1M
Value of assets in TDA	≤$5K	8.9%	1.0%	2.7%	0.7%	0.8%	0.1%	0.0%
	($5K, $10K)	4.1%	1.2%	2.3%	0.9%	0.4%	0.4%	0.0%
	($10K, $50K)	9.2%	3.8%	9.6%	3.7%	4.6%	0.4%	0.3%
	($50K, $100K)	3.7%	1.4%	5.7%	2.2%	2.5%	0.5%	0.4%
	($100K, $500K)	1.5%	1.4%	6.8%	3.1%	7.6%	1.7%	1.5%
	($500K, $1M)	0.0%	0.1%	0.5%	0.5%	1.6%	0.3%	0.6%
	>$1M	0.0%	0.1%	0.0%	0.0%	0.3%	0.1%	0.6%

Note: SCF = Survey of Consumer Finances; TA = taxable account; TDA = tax-deferred account.

Households with higher assets in the TAs tend to hold a higher share of their TAs assets in stocks than households with lower assets in the TAs. As expected, households' risk-aversion level has a significant impact on their asset allocation decisions. Households who are willing to take higher financial risk appear to hold much higher share of equity in the TAs. The effects of age, education, and nonfinancial income on the share of equity in the TAs are generally positive. We also find that black households tend to hold a lower share of equity in the TAs.

Column 2 presents a regression equation in which the dependent variable is the share of equity in the TDAs. Similar to the effect on equity share in the TAs, households' risk-aversion level also has a positive and statistically significant impact on their asset allocation decisions in the TDAs. Households who are willing to take higher financial risk appear to hold much higher share of equity in the TDAs. Post–high school education, nonfinancial income, and TDAs assets tend to have a positive effect on the share of equity in the TDAs. On the other hand, age has a significantly negative effect on the share of equity in the TDAs.

Column 3 reports a regression equation in which the dependent variable is the asset location measure, the difference between the equity share in the TDAs and the equity share in the TAs. There is evidence of a link between TAs assets and the asset location measure. The asset location measure for households with higher TAs assets is significantly lower than that for households with lower TAs assets. Age also has a negative and statistically significant impact on the asset location measure. The coefficient estimates provide only weak support for the role of nonfinancial income in affecting asset location decisions. The coefficient of nonfinancial income is negative but not statistically significantly different from zero. The effects of education, risk-aversion level, and TDAs assets are positive and not significant. We also find that real estate net worth has a significantly positive effect on asset location measure, while the effect of mortgage is negative.

Changes in Asset Location

This section examines the asset location patterns for households with both accounts in the 2001, 2004, and 2007 SCFs. We then discuss the potential factors that may have affected households' asset location decisions across surveys.

Asset Location in Three Latest Surveys

Bergstresser and Poterba (2004) have documented households' asset location decisions using the 1989–2001 SCFs. Is there any change in asset

Table 5. Determinants of Asset Allocation and Asset Location in 2004 SCF[a]

	Share of equity in TA		Share of equity in TDA		Asset location measure	
Explanatory Variable	Estimate	(Standard error)	Estimate	(Standard error)	Estimate	(Standard error)
Head age: [40, 60)	.0296	(.0232)	−.0530	(.0198)***	−.0827	(.0311)***
Head age: [60, +)	.0319	(.0290)	−.0807	(.0258)***	−.1125	(.0383)***
Household size	−.0142	(.0073)*	−.0045	(.0064)	.0098	(.0095)
High school	.0125	(.0489)	.0142	(.0439)	.0017	(.0693)
Post–high school	.0569	(.0475)	.0688	(.0425)	.0119	(.0671)
Black	−.0892	(.0346)***	−.0542	(.0363)	.0351	(.0499)
Hispanic, Asian, or other nonwhite	.0172	(.0308)	−.0074	(.0265)	−.0246	(.0375)
Married	.0132	(.0321)	−.0055	(.0278)	−.0187	(.0414)
Widowed, divorced, or separated	.0197	(.0340)	−.0058	(.0296)	−.0255	(.0439)
Will take average financial risk	.1176	(.0231)***	.1197	(.0235)***	.0022	(.0330)
Will take above average financial risk	.1626	(.0253)***	.2206	(.0253)***	.0581	(.0354)
Will take substantial financial risk	.1603	(.0366)***	.2685	(.0346)***	.1083	(.0474)**
Get advice from broker/financial planner	.0073	(.0155)	.0143	(.0141)	.0070	(.0201)
ln(nonfinancial income)	.0034	(.0031)	.0019	(.0030)	−.0016	(.0039)
ln(TA assets)	.0453	(.0036)***	−.0049	(.0035)	−.0501	(.0048)***
ln(TDA assets)	−.0014	(.0052)	.0054	(.0049)	.0068	(.0072)
ln(real estate net worth)	−.0074	(.0029)**	.0049	(.0024)**	.0123	(.0039)***
ln(private business equity)	−.0012	(.0012)	.0011	(.0011)	.0023	(.0016)
ln(mortgage)	.0059	(.0014)***	−.0003	(.0014)	−.0062	(.0018)***
ln(other liabilities)	.0006	(.0016)	.0001	(.0015)	−.0005	(.0021)
R^2	.1832		.0845		.0915	
Number of households	2149		2149		2149	

Note: SCF = Survey of Consumer Finances; TA = taxable account; TDA = tax-deferred account.

[a]This table provides the results from the regressions of equation (1) for the 2004 SCF. The dependent variables are the share of equity in TA, the share of equity in TDA, and the asset location measure, which is the difference between the equity share in the TDA and that in the TA. All logarithms are computed in the natural base and winsorized at zero. Standard errors are in parentheses. ***(**, *) stands for statistically significant at 1(5, 10) percent level.

location after 2001? Here we are interested in comparing asset location in the 2004 and 2007 SCFs with that in the 2001 SCF. It turns out this comparison is not straightforward. The main problem is that the question on asset allocation of TDAs in 2001 and previous years differs from that in the 2004 and 2007 SCFs. For example, the question on asset allocation of defined contribution pension plans in the 2001 SCF asks,

X4234(#1a) How is the money in this account invested? Is it mostly in stocks, mostly in interest earning assets, is it split between these, or what?

1. *Mostly or all stock; stock in company
2. *Mostly or all interest earning; guaranteed; cash; bank account
3. *Split; between stock and interest earning assets
4. Real estate
5. Insurance / Retirement Plan
-7. *Other
0. Inap.

Comparing this question to that in the 2004 and 2007 SCFs, we find that "mostly or all" has been changed to "all" since 2004. Another important difference is that when the answer to the question is a split (answer "3"), the 2001 SCF does not provide the exact share of equity, while the 2004 and 2007 SCFs do.

To construct estimates of the asset composition in the TDAs in 2001, we follow Amromin (2003) and Bergstresser and Poterba (2004) and assume that (1) all of the account value is assigned to the category that is indicated to be the single category in which "mostly or all" holdings are invested and (2) the account value is divided equally if a combination of categories is reported.

Table 6 reports asset location decisions in the three surveys. For households with both accounts in these surveys, more than 90 percent of households participated in the stock markets. These households could hold stocks in either account or in both accounts. The stock market participation rate was much higher in the TDAs than in the TAs. Across surveys, the equity share of total financial assets for households that participate in stock markets dropped after 2001. It was 62.4 percent and 52.7 percent in 2001 and 2004, respectively. For stock market participants, we also report in the table the equity share in the TDAs, the equity share in the TAs, and the difference between the equity shares. In general, the equity share in the TDAs was higher than that in the TAs. How about the difference between the equity share in the TDAs and that in the TAs, the asset location measure? It dropped significantly from 35.1 percent in 2001

Table 6. Asset Location Decisions in Latest SCFs

	2001	2004	2007
All households			
Percent of households with equity	90.1%	92.3%	91.2%
Percent of households with equity in TA	54.0%	56.1%	47.7%
Percent of households with equity in TDA	82.2%	86.6%	85.8%
Equity as percentage of total financial assets for households with equity (mean)	62.4%	52.7%	50.3%
Equity as percentage of TA assets for households with equity (mean)	37.6%	36.1%	30.9%
Equity as percentage of TDA assets for households with equity (mean)	72.7%	57.7%	56.7%
Difference between the equity shares in TDA & TA for households with equity	35.1%	21.6%	25.7%
Households under age 60			
Percent of households with equity	92.7%	93.9%	91.2%
Percent of households with equity in TA	51.6%	52.3%	43.8%
Percent of households with equity in TDA	88.2%	89.6%	87.9%
Equity as percentage of total financial assets for households with equity (mean)	62.6%	53.8%	51.4%
Equity as percentage of TA assets for households with equity (mean)	35.1%	34.5%	28.8%
Equity as percentage of TDA assets for households with equity (mean)	75.4%	60.3%	58.9%
Difference between the equity shares in TDA & TA for households with equity	40.3%	25.8%	30.1%
Households over age 60			
Percent of households with equity	80.3%	87.5%	90.9%
Percent of households with equity in TA	63.7%	67.9%	59.5%
Percent of households with equity in TDA	60.3%	77.2%	79.2%
Equity as percentage of total financial assets for households with equity (mean)	61.3%	49.0%	47.9%
Equity as percentage of TA assets for households with equity (mean)	48.6%	41.6%	37.6%
Equity as percentage of TDA assets for households with equity (mean)	61.4%	48.7%	50.1%
Difference between the equity shares in TDA & TA for households with equity	12.8%	7.1%	12.5%

Note: SCF = Survey of Consumer Finances; TA = taxable account; TDA = tax-deferred account.

to 21.6 percent (25.7 percent) in 2004 (2007). The drop is largely driven by the sharp decline in the share of equity in the TDAs, while the share of equity in the TAs only dropped slightly. The lower two panels of table 6 present analogous calculation for households with heads under and over the age of sixty.[14] The asset location measure also dropped for the two groups. The majority of households (more than three-quarters) are those with heads under the age of sixty. The results from this group are closer to those from all sample households. Although we only have exact measure of equity holdings in 2004 and 2007 but not in 2001, it appears in Table 6 that households' asset location decisions may have changed in an important way after 2001.

Given the change in question design mentioned above, the change in asset location observed in Table 6 could be caused by the change in the survey question. To deal with this issue, we propose three methods to measure asset composition in the surveys. We then formally examine the asset location patterns across 2001–2007 SCFs by estimating regression models.

For the 2001 SCF, we assign a 100 percent of account value to stocks if the answer to the question on asset allocation is "mostly or all stocks," zero if the answer is "mostly or all interest earning assets," and 50 percent if the answer is "split" in all three methods.

For the 2004 and 2007 SCFs, we use the exact share of equity in method 1. In method 2, we make use of the exact share of equity when the answer is "split." We reassign the answer to "mostly or all stocks" if the answer to the asset composition question is "split" and the exact share of equity is 90 percent or above and reassign the answer to "mostly or all interest earning assets" if the answer is "split" and the exact share of equity is 10 percent or below. The rationale is that households with equity share of 90 percent or above would likely choose "mostly or all stocks" when facing the question in 2001 and that households with equity share of 10 percent or below would likely choose "mostly or all interest earning assets." Thus, a 100 percent of account value goes to stocks if the answer is "all in stocks" or "split" and the share of equities is 90 percent or above; a 100 percent of account value goes to nonstocks if the answer is "all in interest earning assets" or "split" and the share of equities is 10 percent or below; and half of account value is assigned to stocks if the answer is "split" and the share of equities is between 10 percent and 90 percent. The main purpose of doing this is to make the asset composition in the 2004 or 2007 survey comparable to that in the 2001 survey. We do the same in method 3. However, we change 90 percent to 80 percent and 10 percent to 20 percent. We assign a 100 percent of account value to stocks if the answer is "all in stocks"

or "split" and the share of equities is 80 percent or above. A 100 percent of account value goes to nonstocks if the answer is "all in interest earning assets" or "split" and the share of equities is 20 percent or below.

We pool the 2001, 2004, and 2007 SCFs together. The sample includes all households having both accounts and holding stocks (in either account or both). The ordinary least squares (OLS) specification is given by

$$Y = X'\beta + \theta I_{2004} + \delta I_{2007} + \epsilon. \quad (2)$$

The dependent variable is the asset location measure, the difference between the equity share in the TDAs and the equity share in the TAs. The specification includes the same explanatory variables as those in equation (1). To gauge the potential changing pattern of asset location from survey to survey, we include two 0–1 year fixed-effect variables (I_{2004} and I_{2007}) in the estimation. I_{2004} takes a value of 1 for the 2004 SCF households and I_{2007} takes a value of 1 for the 2007 SCF households. θ and δ measure the change in asset location in 2001–2004 and 2001–2007, after controlling for the standard household characteristics.

Table 7 reports the results from the regressions. Consistently across the regressions, we find that age, assets in TAs, and mortgage have negative and statistically significant effects on the asset location measure. The negative effect of age on the asset location measure is supported by our preliminary evidence reported in Table 6 that the difference between the equity share in the TDAs and the equity share in the TAs is smaller for households with heads over age sixty than under age sixty. Households with higher TAs assets tend to hold a higher share of their TAs assets in stocks, and hence, TAs assets have a negative effect on the asset location measure. The regressions also suggest that TDAs assets, real estate net worth, and private business equity have positive and statistically significant effects on the asset location measure. Nonfinancial income also has a negative, though statistically weaker, effect on the asset location measure. From Table 5, risk aversion has a significantly positive effect on both the equity share in the TAs and the equity share in the TDAs. Interestingly, the effect of risk aversion on the asset location measure is not significant. We also find that there are no pronounced patterns in the asset location pattern across education groups. The effect of education is not statistically significantly different from zero.

Having discussed the effects of standard explanatory variables, we now turn to the 0–1 year fixed effect, the variable that is supposed to capture the remaining influences on the asset location pattern across SCF households and years. For all three methods, the coefficient estimates of year dummies suggest that

Table 7. Change in Asset Location across Surveys[a]

	Method 1		Method 2		Method 3	
Explanatory variable	Est.	(SE)	Est.	(SE)	Est.	(SE)
Head age: [40, 60)	−.0665	(.0173)***	−.0561	(.0171)***	−.0703	(.0175)***
Head age: [60, +)	−.1330	(.0222)***	−.1123	(.0220)***	−.1309	(.0225)***
Household size	.0070	(.0053)	.0079	(.0052)	.0092	(.0054)*
High school	.0092	(.0369)	.0046	(.0358)	.0058	(.0370)
Post–high school	.0026	(.0353)	−.0123	(.0342)	−.0019	(.0353)
Black	.0278	(.0270)	.0319	(.0266)	.0267	(.0271)
Hispanic, Asian, or other nonwhite	.0039	(.0235)	.0088	(.0232)	.0019	(.0240)
Married	.0142	(.0239)	.0119	(.0237)	.0120	(.0244)
Widowed, divorced, or separated	−.0084	(.0255)	−.0100	(.0252)	−.0071	(.0259)
Will take average financial risk	.0018	(.0197)	−.0098	(.0196)	−.0105	(.0202)
Will take above average financial risk	.0170	(.0212)	−.0083	(.0211)	.0058	(.0217)
Will take substantial financial risk	.0358	(.0285)	.0174	(.0286)	.0278	(.0291)
Get advice from broker/financial planner	−.0177	(.0118)	−.0212	(.0117)*	−.0201	(.0120)*
ln(nonfinancial income)	−.0038	(.0022)*	−.0047	(.0022)**	−.0041	(.0022)*
ln(TA assets)	−.0546	(.0028)***	−.0562	(.0028)***	−.0565	(.0029)***
ln(TDA assets)	.0134	(.0043)***	.0114	(.0043)***	.0139	(.0044)***
ln(real estate net worth)	.0081	(.0021)***	.0074	(.0021)***	.0079	(.0022)***
ln(private business equity)	.0035	(.0009)***	.0038	(.0009)***	.0035	(.0010)***
ln(mortgage)	−.0036	(.0011)***	−.0034	(.0011)***	−.0033	(.0012)***
ln(other liabilities)	−.0019	(.0012)	−.0014	(.0012)	−.0019	(.0012)
Dummy for year 2004	−.0856	(.0138)***	−.0934	(.0137)***	−.0784	(.0139)***
Dummy for year 2007	−.0489	(.0139)***	−.0578	(.0138)***	−.0426	(.0141)***
R^2	.1131		.1256		.1173	
Number of households	6541		6517		6482	

Note: SCF = Survey of Consumer Finances; TA = taxable account; SE = standard error; TDA = tax-deferred account.

[a]This table provides the results from the regressions of equation (2). We pool together the 2001, 2004, and 2007 SCFs, and use three methods to measure the asset composition. The dependent variable is the asset location measure. All dollar values are converted into 2004 price. All logarithms are computed in the natural base and winsorized at zero. Standard errors are in parentheses. ***(**, *) stands for statistically significant at 1(5, 10) percent level.

Table 8. Asset Composition for Heads' First Pension[a]

	2001	2004	2007
Mostly or all stock	52.3%	26.7%	26.4%
Split	37.6%	48.2%	59.4%
Mostly or all interest earning assets	10.1%	25.1%	14.2%

[a]This table shows the distribution of households according to their answers to the question on asset composition for heads' first pension from current main job. In 2004 and 2007, "mostly or all" is actually "all."

the asset location pattern has changed in an important way after 2001. Compared to that in the 2001 SCF, the asset location measure for households with both accounts in the 2004 SCF dropped by 8 to 9 percentage points. It dropped by 4 to 6 percentage points for the 2007 SCF households. The decline is statistically significant at the 1 percent level in both cases.[15]

One may wonder that the change in asset location pattern is partly due to employer matching in defined contribution pension plans because employer matching may impose certain constraints on asset allocation in those plans. Given that households have complete control over asset allocation in their IRAs, we also look at a subsample of those households with IRAs. Some households in the subsample have TDAs holdings only in an IRA, while others have both IRA and non-IRA holdings. When we analyze the subsample with IRA holdings, we define our measure of TDAs using only the assets held in the IRA. We find that the coefficients for the 2004 and 2007 dummy variables are also negative. The asset location measure dropped 5 to 6 percentage points for 2004 SCF households and the decline is statistically significant at the 1 percent level.

Given the change in the question on asset composition after 2001, we also look at households' answers to the question directly. We expect that the change from "almost or all" to "all" should move households toward "split." Table 8 shows the distribution of households according to their answers to the question for heads' first pension from current main job in the three surveys. As expected, we find a big drop in the "mostly or all stock" category when it changed to "all in stocks" in 2004 and 2007, and the percentage of households whose answers are "split" went up. The table, however, shows a surprising increase in "all in interesting earning assets" in 2004. In 2001, about 10.1 percent households chose "almost or all in interest earning assets," while 25.1 percent households reported "all in interest earnings assets" in their first pensions in 2004. This suggests that households

hold fewer stocks in the TDAs after 2001. The result is supportive to our main finding that the asset location measure has changed after 2001.

Explaining the Change in Asset Location

What accounts for the change in asset location after 2001? In particular, why did the share of equity drop more in the TDAs than in the TAs? Next we discuss some explanations.

One possible explanation of the change in asset location comes from the developments of U.S. stock markets. The market meltdown in 2001–2003 may have induced many households to cut back stock holdings. Given that there is no tax consequence in rebalancing portfolios in the TDAs, it is likely that some households have adjusted their stock holdings in the TDAs. If these households maintain their lower equity exposure in the TDAs after the adjustment, the difference between the equity share in the TDAs and the equity share in the TAs would drop after 2001.

One might think that households may never bother changing their asset allocation in either account because of inertia. In this case, given that (1) the equity share in the TDAs is normally higher than that in the TAs and (2) a stock market meltdown like the one in 2001–2003 lowered the value of equity in both accounts, will the decline in equity value change the asset location measure? It turns out the effect depends on the initial asset allocation in each account. The difference between the equity shares in both accounts after a market meltdown could increase, decrease, or be the same. Market developments in 2001–2003 may have lowered the asset location measure for some households. However, this explanation (that households never changed their asset allocation and a market meltdown lowered the value of equity) is not consistent with the finding that the equity share in the TDAs dropped significantly, while the equity share in the TAs only dropped slightly.

The change in asset location may also be related to the Jobs and Growth Tax Relief and Reconciliation Act of 2003 (hereafter, the "2003 tax cut"). The main provisions of the 2003 tax cut introduced a favorable treatment for dividend income and realized capital gains in TAs. Instead of facing the regular progressive individual income tax schedule, taxpayers in the 10 percent or 15 percent bracket faced a new dividend tax rate of 5 percent, while taxpayers in higher income tax brackets (25 percent, 28 percent, 33 percent, and 35 percent) faced a new dividend tax rate of 15 percent. The 2003 tax cut also reduced the income tax rate on long-term capital gains from 10 percent to 5 percent for those in the 10 percent or 15 percent bracket and from 20 percent to 15 percent for those in higher income tax brackets. The new

rates did not apply to dividends or capital gains received in TDAs because returns are tax deferred in those accounts. Thus, the 2003 tax cut significantly lowered the tax rate on stock returns in TAs and hence increased the gap between the tax rate on bond returns and the tax rate on stock returns. It may have an important impact on households' asset location decisions. This is because when households make asset location decisions, essentially they are comparing the benefits from pretax accumulation of stock returns and after-tax accumulation of bond returns with the benefits from pretax accumulation of bond returns and after-tax accumulation of stock returns. Thus, changes in the tax code affect the benefits from pretax accumulation and hence asset location decision. The tax cut may have induced many households to hold fewer stocks in TDAs and contributed to the change in asset location for U.S. households because the benefits from pretax accumulation of stock returns (and after-tax accumulation of bond returns) have decreased.

Another explanation of the falling equity share in the TDAs is the difference in the investment choices provided to participants in the TDAs. During the booming market of the 1990s, the fraction of equity funds offered in TDAs (e.g., employer-sponsored plans like 401(k)) increased, which may have led to an increase in equity investment by workers. It is not unreasonable to think that the fraction of equity funds decreased during or after the stock market downturn in 2001–2003, and this would lead to less investment in equities. However, Huberman and Jiang (2006) have shown that there is little relation between the proportion of contributions that participants allocate to equity funds (equity allocation) and the proportion of equity funds that their plans offer (equity exposure).

Conclusion

Using the latest SCFs, we document a significant decline in the difference between the equity share in TDAs and the equity share in TAs after year 2001. Using the difference as a dependent variable, our cross-sectional regressions show that the fixed-effect estimate for year 2004 (2007) is significantly negative if we pool together households in the 2001, 2004, and 2007 SCFs. This suggests that asset location has changed in an important way after 2001. We discuss some potential explanations for the change in asset location. We associate our preliminary finding with households' responses to the stock market downturn in 2001–2003 and the 2003 tax cut that considerably lowered the tax rate on stock returns (both dividends and realized long-term capital gains). It will be interesting to see the asset

location patterns in the future SCFs and to compare the asset location patterns observed in SCFs with those from other surveys.

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Notes

1. Examples of TDAs include IRAs, Keogh, and employer sponsored defined contribution plans such as 401(k) and 403(b).
2. The difference is defined as the result of the equity share in TDAs minus the equity share in TAs.
3. It is worth noting that if households have accumulated capital losses, they may reduce equity holdings in the TAs because net capital losses in the TAs are deductible.
4. The tax cut was first proposed by the Bush administration on January 7, 2003, and was officially signed into law on May 28, 2003. The tax cut was scheduled to expire after 2010. The Obama administration has extended it for another two years.
5. Instead of facing the regular progressive individual income tax schedule, taxpayers in the 10 percent and 15 percent brackets faced a new dividend tax rate of 5 percent, while taxpayers in higher income tax brackets (25 percent, 28 percent, 33 percent, and 35 percent) faced a new dividend tax rate of 15 percent. The 2003 tax cut also reduced the income tax rate on long-term capital gains from 10 percent to 5 percent for those in the 10 percent or 15 percent bracket and from 20 percent to 15 percent for those in higher income tax brackets.
6. For another effect of the 2003 tax cut, Chetty and Saez (2005) document a large increase in dividend payments by nonfinancial, nonutility publicly traded corporations following the tax cut.
7. The SCF covers a representative cross section of U.S. households and a special sample of high-income households identified from tax returns.

8. TAs assets include certificates of deposit, savings accounts, money market accounts, mutual funds, savings bonds and other bonds, directly owned stock, brokerage accounts, annuity, trusts, and managed investment accounts. We exclude checking accounts (because holdings of checking accounts are likely driven by liquidity concerns and do not reflect long-term investment positions), life insurance, and miscellaneous assets from our measure of TAs assets.
9. We define TDAs as retirement accounts in which the owners make pretax contributions (with an annual limit) and can make their own investment decisions. These accounts include IRAs, Keogh, and most of the defined contribution pension plans (401K/403B/SRA, Thrift Savings, and TIAA-CREF). For the defined contribution pension plans, the survey provides information of three plans for each spouse. We use all of them.
10. These include the principal residence, investment real estate, and vacation properties.
11. We choose this age because the tax rules that affect withdrawals from the TDAs change when the account owner turns 59.5. Distributions before age 59.5 are subject to a penalty rate of 10 percent for many TDAs in the United States. Individuals above this age can withdraw funds from the TDAs without penalty, so assets inside and outside the TDAs are closer substitutes aside from the tax treatment of income.
12. These control variables are taken directly from the Survey of Consumer Finances. Because SCF uses a multiple imputation procedure, we average the values for each variable across the implications in each survey.
13. In general, the results from the 2007 SCF are similar to those from the 2004 SCF.
14. We also look at different household groups according to the ratio of TDAs assets to total financial assets, home ownership, and entrepreneurship. We find that the difference was consistently and significantly lower in 2004 and 2007 for all groups.
15. In another experiment, we reassign the answer to "mostly or all stocks" if the answer to the asset composition question is "split" and the exact share of equity is 70 percent or above and reassign the answer to "mostly or all interest earning assets" if the answer is "split" and the exact share of equity is 30 percent or below. We find that the coefficients of dummies for the 2004 and 2007 SCFs are -0.073 and -0.026, respectively.

References

Amromin, Gene. 2003. "Household Portfolio Choices in Taxable and Tax-Deferred Accounts: Another Puzzle?" *European Finance Review* 7:547-82.

Bergstresser, Daniel, and James M. Poterba. 2004. "Asset Allocation and Asset Location: Household Evidence from the Survey of Consumer Finances." *Journal of Public Economics* 88:1893-915.

Black, Fischer. 1980. "The Tax Consequence of Long-Run Pension Policy." *Financial Analysts Journal* 36:21-28.

Bodie, Zvi, and Dwight B. Crane. 1997. "Personal Investing: Advice, Theory, and Evidence." *Financial Analysts Journal* 53:13-23.

Chetty, Raj, and Emmanuel Saez. 2005. "Dividend Taxes and Corporate Behavior: Evidence from the 2003 Dividend Tax Cut." *Quarterly Journal of Economics* 120:791-833.

Dammon, Robert M., Chester S. Spatt, and Harold H. Zhang. 2004. "Optimal Asset Location and Allocation with Taxable and Tax-Deferred Investing." *Journal of Finance* 59:999-1037.

Huberman, Gur, and Wei Jiang. 2006. "Offering Versus Choice in 401(k) Plans: Equity Exposure and Number of Funds." *Journal of Finance* 61:763-801.

Poterba, James M. 2004. "Valuing Assets in Retirement Saving Accounts." *National Tax Journal* 57:489-512.

Reichenstein, William. 2006. "After-Tax Asset Allocation." *Financial Analysts Journal* 62:14-19.

Shoven, John B., and Clemens Sialm. 2003. "Asset Location in Tax-Deferred and Conventional Savings Accounts." *Journal of Public Economics* 88:23-38.

Tepper, Irwin. 1981. "Taxation and Corporate Pension Policy." *Journal of Finance* 36:1-13.

The Vanguard Group. 2004. "How America Saves, 2004: A Report on Vanguard Defined Contribution Plans." www.vanguardretirementresearch.com.

Zhou, Jie. 2009. "The Asset Location Puzzle: Taxes Matter." *Journal of Economic Dynamics and Control* 33:955-69.

Bios

Yothin Jinjarak is a senior lecturer in the Department of Financial and Management Studies at School of Oriental and African Studies (SOAS), University of London. His main research interests are fiscal policy, international finance, development and macroeconomics.

Jie Zhou is an assistant professor in the Division of Economics at Nanyang Technological University, Singapore. His main research interests are in household finance, pensions, and retirement savings.